

Application No. 10/757,771
Amendment dated April 24, 2006
Reply to Office Action of January 23, 2006

PATENT

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

1. (Original) A method of filling a gap defined by adjacent raised features on a substrate, comprising:
 - providing a flow of a silicon-containing processing gas to a chamber housing the substrate;
 - providing a flow of an oxidizing gas to the chamber;
 - depositing a first portion of a film as a substantially conformal layer in the gap by causing a reaction between the silicon-containing processing gas and the oxidizing gas, wherein depositing the conformal layer comprises varying over time a ratio of the (silicon-containing processing gas):(oxidizing gas) and regulating the chamber to a pressure in a range from about 200 torr to about 760 torr throughout deposition of the conformal layer;
 - thereafter, depositing a second portion of the film as a bulk layer, wherein depositing a second portion of the film comprises maintaining the ratio of the (silicon-containing processing gas):(oxidizing gas) substantially constant throughout deposition of the bulk layer and regulating the chamber to a pressure in a range from about 200 torr to about 760 torr throughout deposition of the bulk layer; and
 - thereafter, exposing the substrate to nitrous oxide at a temperature less than about 900°C to anneal the deposited film.
2. (Original) The method of claim 1, wherein exposing the substrate to nitrous oxide at a temperature less than about 900°C to anneal the deposited film comprises exposing the substrate to nitrous oxide at a temperature less than about 750°C to anneal the deposited film.
3. (Original) The method of claim 1, further comprising thereafter planarizing the film.

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4. (Original) The method of claim 3, wherein planarizing the film comprises subjecting the film to chemical mechanical polishing.

5. (Previously Presented) A method of forming isolation structures in a silicon substrate, comprising:

etching trenches in the substrate;

providing a flow of a silicon-containing processing gas to a chamber housing the substrate;

providing a flow of an oxidizing gas to the chamber;

causing a reaction between the silicon-containing processing gas and the oxidizing processing gas to form a silicon oxide layer at least in part by:

depositing a first portion of a film as a substantially conformal layer in the trenches by causing a reaction between the silicon-containing processing gas and the oxidizing gas, wherein depositing the conformal layer comprises varying over time a ratio of the (silicon-containing processing gas):(oxidizing gas) and regulating the chamber to a pressure in a range from about 200 torr to about 760 torr throughout deposition of the conformal layer; and

thereafter, depositing a second portion of the film as a bulk layer, wherein depositing a second portion of the film comprises maintaining the ratio of the (silicon-containing processing gas):(oxidizing gas) substantially constant throughout deposition of the bulk layer and regulating the chamber to a pressure in a range from about 200 torr to about 760 torr throughout deposition of the bulk layer;

heating the substrate in the presence of nitrous oxide; and

thereafter, planarizing the layer.

6. (Original) The method of claim 5, wherein planarizing the layer comprises subjecting the layer to chemical mechanical polishing.

7. (Canceled)

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8. (Previously Presented) The method of claim 5, wherein heating the substrate in the presence of nitrous oxide comprises exposing the substrate to nitrous oxide at a temperature less than about 900°C to anneal the deposited film.

9. (Currently Amended) A method of forming a silicon oxide layer on a substrate, comprising:
providing a flow of a silicon-containing processing gas to a chamber housing the substrate;

providing a flow of an oxidizing processing gas to the chamber;

causing a reaction between the silicon-containing processing gas and the oxidizing processing gas to form a silicon oxide layer; and

heating the substrate in the presence of nitrous oxide to a temperature greater than or equal to 1000° C in a rapid thermal process for a duration ~~greater than or equal to 1 minute~~ from about 5 seconds up to around three minutes to anneal the deposited film.

10. (Original) The method of claim 9, wherein:

providing a flow of a silicon-containing processing gas comprises providing a flow of tetraethylorthosilicate (TEOS); and

providing a flow of an oxidizing processing gas comprises providing a flow of ozone.

11. (Original) The method of claim 9, wherein causing a reaction between the silicon-containing processing gas and the oxidizing gas comprises regulating the pressure of the chamber to sub-atmospheric levels.

12. (Original) The method of claim 11, wherein the sub-atmospheric levels comprise pressures in a range from about 200 torr to less than about 760 torr.

13. (Original) The method of claim 9, wherein causing a reaction between the silicon-containing processing gas and the oxidizing processing gas comprises regulating the temperature of the chamber to a range from about 400° C to about 570° C.

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14-16. (Canceled)

17. (Currently Amended) A method of forming a silicon oxide layer on a substrate, comprising:

providing a flow of a silicon-containing processing gas to a chamber housing the substrate;

providing a flow of ozone to the chamber;

causing a reaction between the silicon-containing processing gas and the ozone to form a silicon oxide layer; and

heating the substrate in the presence of nitrous oxide in a furnace to a temperature in the range from about 750° C to about 1000° C to anneal the deposited film.

18. (Original) The method of claim 17, further comprising introducing steam into the furnace.

19. (Original) The method of claim 17, wherein the silicon-containing processing gas comprises tetraethylorthosilicate (TEOS).

20. (Currently Amended) A method of forming a silicon oxide layer on a substrate, comprising:

providing a flow of tetraethylorthosilicate (TEOS) processing gas to a chamber housing the substrate;

providing a flow of ozone to the chamber;

regulating the pressure of the chamber to a pressure in a range from about 200 torr to less than about 760 torr;

causing a reaction between the TEOS and the ozone to form a silicon oxide layer; and

heating the substrate in the presence of nitrous oxide to a temperature greater than or equal to 1000° C in a rapid thermal process for a duration from about 5 seconds up to around three minutes to anneal the deposited film ~~for a duration greater than or equal to 1 minute.~~

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21–22. (Canceled)

23. (Currently Amended) A method of forming a silicon oxide layer on a substrate, comprising:

providing a flow of tetraethylorthosilicate (TEOS) processing gas to a chamber housing the substrate;

providing a flow of ozone to the chamber;

regulating the pressure of the chamber to a pressure in the range from about 200 torr to less than about 760 torr;

causing a reaction between the TEOS and the ozone to form a silicon oxide layer; and

heating the substrate in the presence of nitrous oxide in a furnace to a temperature in the range from about 750° C to about 1000° C to anneal the deposited film.